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ABSTRACT

The Wyoming Center for Teaching and Learning Network at the University of Wyoming (UW) investigated barriers to distance learning and implemented a system that circumvented or eliminated these barriers. One four-year college and seven community colleges chose to be interactively connected. Many UW faculty members, accustomed to delivering classes through a phone network or flying professor program, were not resistant to the concept. Compressed video had a cost advantage over the current commitment to the flying professor arrangement. Several ideas for using the compressed video network were explored: early observation of technology education classes; supervision of student teachers; cooperative development and delivery of courses; team teaching; and simultaneous delivery of course content on and off campus. Technical comparisons were made of three systems: Compression Labs, Videotelecom, and Picturetel. Strengths and weaknesses were compiled and an overall assessment made. University and middle school students evaluated the systems. A steering committee offered guidance during the hardware selection procedure. The Videotelecom system was selected because of the flexibility provided by the built-in computer, more cost-effective local vendor support for maintenance, and free software upgrades for the first year. Several local districts committed to installing compressed video systems. (YLB)

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Slow Scan Video in the Preparation of Technology Educators

Presented at the AVA
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Distance learning is not new. Nor is the concept of Telecommunications. However, many states have had a great deal of difficulty in actualizing the concepts involved. Many things have entered into this difficulty. Among them are: governmental regulations, turf fights, an ever changing technological base, faculty that are resistant to the concepts, debates over whether the systems should be owned publicly or privately, and costs.

The Wyoming Center for Teaching and Learning Network (WCTLN) has been formed at the University of Wyoming to investigate these barriers and implement a system that circumvents or eliminates these barriers. This center is now responsible for coordinating the implementation of a compressed video interactive network. Dr. Barbara Hakes, the center's Director, has personally supervised the on site testing and evaluation of several types and configurations of compressed video networks since her appointment to this position.

Implementation Barriers

1. Governmental Regulations

Regulations in Wyoming are limited. They are primarily limited to commercial ventures.

2. Turf Fights

Wyoming has an advantage related to the area of turfdom. There is only one four college in the state, the University of Wyoming. There are also only seven community colleges. All of these entities have decided to be interactively connected and not vie for sole proprietorship. The system chosen is discussed later in this paper. It should be noted however, that this connection will be through compressed video in order to take advantage of existing telephone lines.

This cooperative attitude has extended from the colleges to the local school districts and the state government. The system being installed in Wyoming will be the standard for the state. This means that all schools wishing to participate in interactive telecommunications, district to district and district to University, will be standardized. They will all use the same handshake. Therefore there will be no difficulty "talking" to each other.

3. Ever changing Technological Base

Buying a compressed video system is somewhat like buying a new automobile or a new computer. When do you make your move? Do you wait for the next model? It's bound to be better than the current model. Wyoming decided, if you wait for the perfect system, with all the newest features, no action would ever be taken. The time for action is now.

4. Resistant Faculty

Many of the faculty at the University of Wyoming are accustomed to delivering classes through either the

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tellebridge, a phone network, or the flying professor program. These faculty are well aware of the difficulties inherent in distance learning. They see the advantages of being able to interact with students and other faculty without flying to a distant location. Additionally, the University pays a premium for developing and delivering instruction remotely.

5. Public Versus Private ownership

Being a rural state with only 450,000 inhabitants, telephone companies are not breaking down our doors to offer two way interactive video on a lease basis. We are therefore, not faced with the debate of public or private ownership of the system. The major telephone service provider, U S West, has been very cooperative and helpful in the evaluation phase of our project. They provided low cost line time and have served on our steering committee to answer technical questions related to their ability to provide service through various hardware configuration schemes.

6. Costs

Costs will always be a factor in distance education situations. They were no less a concern in Wyoming. However, when compared to maintaining the current commitment to the flying professor arrangement, compressed video has a distinct advantage.

In order to offset initial costs, grant funding was sought. IBM donated 24 microcomputers for use with the network. These computers have been distributed to the sites where the compressed video systems are to be installed. IBM has also been of immeasurable assistance during the selection process and continues to offer support.

The hardware configuration selected, costs between $42,461 and $83,231 per location, depending on the configuration chosen. Telephone line charges will run $40.00 per hour. These costs will be shared by the seven community colleges and local education agencies (LEA) as they come on line. Each location will fund their own station and will pay a proportionate share of the costs for line time. These costs will be determined by splitting the costs based on which locations were on line for a given program/activity.

Planned Uses

Frequently, it is perceived that distance learning works only one way. Traditionally it has been disseminated from the universities to the local districts. This is not the case in Wyoming. A great deal of information will flow in both directions. The university doesn't perceive itself to have a monopoly on creativity, innovation, or expertise. Several ideas for utilizing the compressed video network are listed here. Among them are: early observation of Technology Education classes; supervision of student teachers; cooperative development and delivery of courses; simultaneous delivery of course content on campus and off campus. Small districts, of which Wyoming has a preponderance, can offer classes through the system they otherwise could not afford.

1. Early Observation

Students have a limited number of Technology Education

classes to visit and observe. This limitation will be somewhat relieved through compressed video access. Students will be required to observe classes earlier in their preparation than was practical before.

2. Student Teacher Supervision

Being a rural state supervision of student teachers has always presented problems. Field representatives with little or no experience, in teaching laboratory centered activities, are asked to supervise student teachers in technology education. This fact coupled with the understanding that certain things can be best learned in the "real world" led the University to investigate distance learning for this application.

Student teachers can be observed in normal classroom activities relatively unobtrusively. The compressed video system is somewhat threatening at first. But, after a short while the students and teachers virtually forget it's there. This allows for specialists in content, methodology, discipline, and others to sit in on the student teachers classes without overloading the classroom with "threatening professors". Immediately following the class, or at the end of the day, all interested parties from both locations can sit down together and critique the class from a variety of perspectives. This immediate feedback is more useful than delayed evaluations, sometimes offered only in the form of a grade assignment.

Another possibility, yet to be field tested, is prompting the student teacher during class to offer suggestions or direction. This could be done much as it is for TV announcers and news people. The student teacher would wear an earphone through which instructions and suggestions could be made unobtrusively.

3. Cooperative Course Development

Many teachers in the field have great ideas related to course content and innovative methods of delivery. These ideas can be cooperatively integrated into class development. Teachers in local districts in concert with University personnel can create courses incorporating the best thoughts of a multitude of teachers. Each can share experiments they have found to be particularly successful. This can all be accomplished without travel or a commitment to several days away from home.

4. Team Teaching at a Distance

A combination of teachers in several locations can jointly teach a course. These courses can range from graduate courses focusing on change, to courses in basic teaching strategies. Technical coursework can be delivered in a team teaching environment with a team of experts "on tap" via compressed video. This team of experts may be comprised of a math teacher, a language arts teacher, a science teacher, and a technology teacher. In this way the students gain from expertise in a variety of interrelated disciplines.

In a rural state with limited resources, this kind of cooperative learning experience is difficult, if not

impossible, to facilitate in the normal "flying professor" arrangement. Costs are prohibitive as well as time constraints of several professors make it virtually impossible to arrange.

5. Simultaneous Delivery of courses

Travel distance creates special hardships for graduate students enrolled at the University of Wyoming. The University is located in the lower eastern corner of the state, a considerable distance from some of our school districts. Consequently, for many of the state's technology teachers, graduate courses offered any time but summers are prohibitive. This can significantly lengthen the time required to earn a graduate degree.

With simultaneous delivery of selected graduate courses in remote locations and on the University campus, these students no longer have to reserve several summers for graduate study. Typically, a masters degree can be completed within two calendar years.

6. Small District Class Offerings

Small districts, those unable to provide a certified technology teacher, can offer technology education to their limited number of students through compressed video. A technical lab assistant will be required at these remote locations to set up learning activities and supervise laboratory processes. A certified technology teacher is not necessary at these locations, due to the teacher being on line interactively.

Technical Limitations in Wyoming

The first limitation that was discovered through this process was that some of the equipment on the market requires T1 cable service in order to operate, others require optical fiber. Neither of these are widely available throughout Wyoming.

One unexpected outcome of the research project and evaluation phase, was that of discovering more resources within the state than any one agency was aware of. For example, there was a much better technical base in the state than had been expected.

Technical Comparisons of Systems

It become extremely difficult to compare systems when there is no industry standard. Some systems come configured with all the bells and whistles while others come only as bare bones, with options. Some have external connections while others are limited to the hardware shipped with the system. Some require T1 telephone cable. Others require optical fiber. Still others do not require special phone lines. The three systems pilot tested were Compression Labs Inc. (CLI), Videotelecom, and Picturetel.

The following is a compilation of the strengths, weaknesses, and overall assessment of each system, as compiled by Wally Owens.

Videotelecom

Strengths

1. Built-in IBM compatible computer with 40 meg. hard drive
2. Infrared control unit
3. Maintenance agreement with 24 hour turn around on parts

4. Warranty for software upgrade (one year warranty repair or replace with 24 hour turn around for needed replacement)
5. Warranty for software upgrade (One year free software upgrade)
6. Software upgradeable
7. Capture of video and computer graphics, storage to hard or floppy drive, retrieval and forward to remote site
8. Configuration of system with peripherals (Computer/keyboard, pen pal graphics, presenter, remote camera)
9. Pull down menus for diagnostics
10. Integration of system (All panels are in the CODEC)
11. Local vender support provided through US West

Weaknesses

1. Picture quality at 112 and 384 is adequate
2. Sound quality was adequate, but would cut out when simultaneous two way conversation occurred
3. Must always use two monitors, instead of the possibility of picture-in-picture (since been resolved)
4. Remote camera is stationary and not software controlled
5. No presets for cameras (local and remote) -being added
6. Size and weight of unit
7. Hand held remote was difficult to use at times

Overall Assessment

This system offered the most flexibility to the instructional designer. With the built-in computer and the ability to capture, send, and receive video and computer graphics, the system allowed the user to be creative in the presentation.

Picturetel

Strengths

1. Excellent picture quality at 384 and 112
2. Excellent sound quality
3. Picture-in-picture using only one monitor
4. Firmware upgradeable
5. Ease of use of control panel
6. Software control of auxiliary camera
7. Camera presets for near, far-end and aux. cameras
8. Style and weight of cabinet to house system
10. Transparent pull down menus

Weaknesses

1. Control panel is not infrared remote and is attached by a wire to the system
2. Picture-in-picture is totally lost or is put on the small picture when using the presenter or other peripherals such as pen pal. The graphics in the small box is difficult for the person presenting to see.
3. The picture-in-picture cannot be moved to different locations on the screen
4. No built in computer system to capture, save, retrieve

data or graphics
5. Microphone is built into the control panel limiting the flexibility of the presenter
6. Maintenance of system requires a minimum of 48 hour turnaround
7. warranty for hardware is only 90 days. Additional warranty must be purchased
8. Warranty for software must be purchased. No free upgrades are provided
9. Lack of local support from vender
10. Hook-ups for external microphones are not standard jacks--must have special connectors

Overall Assessment

This system has the best overall picture and sound quality of those viewed. However, with the lack of peripherals other than the presenter, it was difficult to give a total perspective of what the system could do. The microphone placed inside the control panel and the control panel having to be attached to the system at all times created many problems for the presenters and the person operating the system--not to mention the liability issue for the classroom of today. Not having a built-in computer also hampered the flexibility of the system. Many applications were not seen because of the lack of the graphics capability with the use of the built-in computer.

CLI

Strengths

1. The touch-screen control panel
2. The ability to toggle between local and remote sites while recording the session on the VCR
3. Firmware upgradeable
4. Internal modem used for diagnostic purposes by the vender's technicians
5. Auxiliary camera is software controlled
6. Picture-in-picture capability even on two monitors. Picture is 1/4 screen and may be positioned differently on the monitor

Weaknesses

1. Control panel attached to system at all times
2. At times, picture would look as if someone was taking flash photography during transmission
3. Size and weight of unit observed--two monitors
4. Sound quality was weak at times--a great deal of fading in and out
5. Complication of set-up of equipment and the wiring of peripherals
6. Volume control of unit was separate from the main control panel
7. Lack of local vender support
8. Warranty--90 days on parts, additional warranty for service may be purchased
9. No warranty on firmware; no free upgrades
10. No built-in computer. Therefore no capturing, saving,

sending, retrieving of computer and video graphics
11. Lack of flexibility in the use of the system for the instructional designer
12. Upgrades must be placed in a board instead of through the CODEC
13. Lack of integration of the system
14. Control panel must be upgraded by circuitry boards
15. This control panel generated more heat than any of the others reviewed

Overall Assessment

Overall this system is the most "pushed", but the most inefficient of the three. The picture and sound quality were better than Videotelecom but much worse than picturetel. The overall design and flexibility of the system left much to be desired. The touch panel control was a bright spot for this system, yet was the only piece that caused downtime (of more than a day!) during the pilot.

Student Evaluations of the Systems

Students, both university and middle school, were intimately involved in the evaluation of the systems. Classes were taught interactively between Gillette and Laramie. The systems were given a great deal of representational research. Local lawyers, board of regents, engineers, geology, mass communications personnel as well as faculty and staff of the university used the systems during their tenure on campus.

One university class was given the assignment to critique each system and report their findings to the steering committee and their class professor. Excerpts from those reports follow:

"Which ever system that is selected, it must be easy to use."

"A hand held remote is a plus."

"The cameras used must do a good job using available light."

"In order to get the most good out of a system it must have the ability to transmit and receive pictures of small objects."

"Cables stretched across the floor should be eliminated. These caused trouble during the demonstration. The teacher tripped over them."

"Picture quality and sound quality both varied. Find a system that does a good job of both."

Hardware Selection Procedure

A steering committee was appointed to offer guidance during this process. Contacts were made with several companies dealing with compressed video systems. It was determined early in the process that only complete systems would be considered. This was done in order to limit the time and technical expertise with the process, needed by our faculty, to assemble systems. Each system was requested on a loan basis for a minimum of two weeks.

After each system had been thoroughly tested through real life situations, the advisory committee meet to make a recommendation.

After comparing notes on function, cost, compatibility, aesthetic appeal, etc. a final recommendation was made.

Following this recommendation, the professional staff compared their findings with those of students, the advisory committee, teachers who used the systems, and all others involved in the systems use.

The system selected was Videotelecom. The greatest plus of this system is the flexibility provided by the built-in computer. Also, the local vender support for maintenance and the free software upgrades for the first year make this system more cost effective.

Outcomes

Several local districts have committed to installing compressed video systems and will be interconnected with all other sites. These are the sites where student teacher supervision, through compressed video, will be first tested. These sites are also the ones where remote observation of classes by students will occur. It is hoped that these activities can begin during the Spring semester of 1992.

By the first of 1992 all seven community colleges will be on line and able to interact with each other as well as the University. Graduate Technology Education courses are planned to be offered at these locations beginning in the Fall of 1992. It is intended to offer these classes both on the University campus and interactively, on the community college campuses.

Undergraduate courses are being developed for delivery through the system. These courses are being developed independently at the present, with input from teachers in the field. Collaborative course construction is planned as soon as the systems are fully functional at the remote sites.